

THURSDAY, SEPTEMBER 18, 1902.

PROF. LORENTZ ON THE SCOPE OF  
PHYSICS.

*Sichtbare und Unsichtbare Bewegungen.* Vorträge gehalten von H. A. Lorentz. German Translation by G. Siebert. Pp. 123. (Brunswick: Vieweg und Sohn, 1902.) Price Mk. 3.

THESE lectures, published under the title of "Motions Visible and Invisible," were delivered at Leyden last year to what would, perhaps, be called in this country a philosophical society. The object was to present to a general audience an outline of the picture of the external world which modern physics is constructing within its own province, without going so far into detail as to lose the general outlook in the interests or difficulties of special departments of knowledge. The keynote of the book, as the title implies, is that all physical explanation rests ultimately on dynamics; and accordingly the first three out of seven lectures are devoted to an exposition of the gist of the dynamics of rectilinear, curved and vibratory motions. Not much originality is to be expected in such well-worn topics, but the freshness of some of the illustrations reveals the calibre of the author. Such, for instance, is the estimation, from Hertz's analytical theory, of the intensity of the pressures set up in the ordinary impact of small balls; when a ball of 800 grammes falls on another such from a height of 12 cm., the total pressure between them mounts up to the order of 600 kilogrammes. The results developed are applied to a brief review of the cardinal phenomena of sound and light, and to the explanation of gaseous pressure and temperature on the kinetic theory. Of personal interest is the remark, on the basis of Michelson's having found that the breadth of a spectral line of a gas approaches a definite limit as the gas is rarefied, that, according to the writer's belief, we have here as direct evidence for the motion of the gas-molecules as spectral displacements give for the motions of the heavenly bodies. We naturally turn to the sixth lecture, on electrical phenomena, in the elucidation of which the author occupies so prominent a position. At the very beginning, the conception is introduced that the ultimate atoms of matter involve positive and negative electrons, which interact through the connection between them that is afforded by the æther, and thus originate all electric phenomena. In the terms of this theory, the main electric phenomena are described, including such as cathode rays, though not much attempt is made to indicate the links of the chain of deduction that bind together the various departments of electrodynamics; finally, a rather more detailed sketch of the significance of the Zeeman effect is given. Thus one is led to see how it comes about that it is now a main effort of physicists to ascribe to these electrons a function in many types of phenomena, and to realise that there is much evidence for the view that they form a very prominent element in the constitution of matter. So far as is known, they are the sole links between ponderable matter and the æther. On them, too, a hope entertained by many is largely based, that gravitation and molecular forces will also turn out of the processes in that medium. The last lecture is an

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exposition of the principle of energy. The writer expresses his opinion that nothing short of careful experimental investigation can assure us of the impossibility of the *perpetuum mobile*, which forms the foundation of the doctrine of energy. The ramifications of that principle are illustrated from the action of a dynamo. The principle thus forms a clue that connects the most varied phenomena, even when we are ignorant of the mechanisms which produce them; we find it an unfailing guide in tracing relations, with a certainty to which no electron-theory or other special theory can pretend. But it is of limited scope; the independence *e.g.* of gaseous viscosity and density, or the effect of motion on spectra, can only be elucidated by penetrating beneath the surface of things and resolving the phenomena into their elements.

To some people, the other side of the question above referred to as to the nature of the negation of the *perpetuum mobile* will doubtless appeal more strongly. A fundamental principle in nature of simple and universal type can hardly be based exclusively on the empirical ground of experimental verification; indeed, this very principle is constantly being applied without any hesitation to considerations so delicate as to be beyond the reach of present experimental confirmation except as regards their remote results. Not the least interesting and promising topic in abstract physical science is the origin and scope of the great natural laws which transcend all distinctions between different kinds of material, and form the frame into which the science is gradually built.

The sketch here given will show that Prof. Lorentz's little book forms a welcome addition to the expositions, popular yet exact, which we possess of the current progress of physical science, even in this country which produces more than its share of such concrete and illustrative presentations; all the more so as the trend of scientific method abroad now seems to seek greater security in the purely abstract exposition of relations, between entities which appear only as pure unknowns by means of mathematical symbols, from the fear that any full-bodied analogy traced between them and other things better known may, by reason of its limitations, encourage views that may ultimately prove false.

J. L.

CELTIC MYTHOLOGY.

*Cuchulain of Muirthemne: the Story of the Men of the Red Branch of Ulster.* Arranged and put into English by Lady Gregory. With a Preface by W. B. Yeats. Pp. xvii + 360. (London: John Murray, 1902.) Price 6s.

EVEN before the appearance of this attractive volume the general reader had no valid excuse for not knowing something of the story of Cuchulain and the other heroes of Ulster; henceforward he will be still more inexcusable if he persists in ignorance. No one who cares at all for early literatures can fail to enjoy this version of these old Irish tales, so unique of their kind and so full of varied interest. The serious student, no doubt, will prefer to go direct to the originals, or to close translations like those collected in Miss Hull's "Cuchullin Saga"; but Lady Gregory's work is so different in aim from Miss Hull's that there is ample room for both. She

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has been chiefly attracted to the tales by their literary merits, and has sought with no little success to make these the prominent feature in her renderings. This at times involves the omission of details that are not without interest, but, after all, there is enough left to give a fair impression of what can be learned from the old literature of Ireland. This mass of legend, for the most part taking its final form about the twelfth century, but demonstrably far older in origin, is, in fact, a perfect mine of primitive custom and belief, and as such is full of interest for the anthropologist. Where the ordinary reader will only see something fanciful or unintelligible, the specialist will often discern an interesting survival or a striking parallel, even if it is hard at times to draw the line between Irish tradition and Irish imagination.

The peculiar character of these tales is due to a double tendency in Irish literature. On the one hand there is an exuberant imagination which recklessly transcends all limits of time and space; on the other there is a love of minute detail which constantly brings in the smallest features of everyday life and work. To the latter tendency we owe the minute descriptions of the appearance and dress of the heroes, of their horses and chariots, their arms and modes of fighting, their palaces and forts, and so on. It is a kind of Homeric life and culture that meets us here, yet with a greater admixture of primitive types, civilisation and barbarism being strangely intermingled. Nor does the Homeric Olympus lack its counterpart, for behind the real world of mortal heroes lies the realm of the Sidhe and the Tuatha De Danann, constantly reminiscent of the old Celtic mythology which Christianity has displaced. With a real and an imaginary world to move between, there is nothing that the Irish story teller will not dare to say; nothing is either too mean or too marvellous for him. Man and animal are interchangeable beings. Cuchulain himself is a reincarnation of Lugh (one of the old gods), who takes the shape of an insect and is swallowed by the sister of Conchubar. Curóí makes his fort whirl round like a millstone all night, so that no one can enter it after sunset. The bridge in Scotland which Cuchulain has to cross can alter its own shape and size at pleasure. Conchubar's shield moans when he is in danger, "and all the shields of Ulster would moan in answer to it." Wells and streams have a faculty of bursting out and overflowing whole tracts of country, and it is out of two lakes that Cuchulain gets his famous pair of horses, the Grey and the Black. Charms and spells are as potent as in Africa, and satire may be so deadly as to kill its victim. Fingian the physician "could tell what a person's sickness was by looking at the smoke of the house he was in." It is three champions of the Sidhe who have to be killed three times before they are done with; but even mortal heroes have an almost feline tenacity of life. It is well for them that this is so, for their chief happiness consists in fighting; in cases of single combat the chariot-driver usually looks on and encourages his master, or goads him on to do his best by means of bitter taunts. Feats of strength and skill are naturally common, but some of those mentioned are not easy to understand. Still stranger are the distortions of Cuchulain when in a rage, for which Lady Gregory has substituted the very euphemistic statement that he assumed the appearance of a god;

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the direct opposite would not overstate the case. Contention and jealousy are rampant among the heroes, and each unblushingly sounds his own praises and states his claims to the "Champion's Portion," which after all is only a certain quantity of food and drink. Yet the spirit of chivalry is not wanting, and an adventurous quest is greatly to their minds. But while they are ready to face most dangers without shrinking, the power of *geasa* or taboo lies heavy on them. Before Conaire meets his death, he has succeeded in doing everything which he ought not to have done. Historically these *geasa* are known from the "Book of Rights," and form a curious study. Of great interest, too, is the periodic weakness of the men of Ulster, which has been the subject of much discussion among scholars.

As to the central figures in the cycle, Conchubar and Cuchulain, many difficult problems present themselves. It is possible that they take the place of older mythological personages, especially as Conchubar is actually called a god in one text and Cuchulain is the representative of Lugh. Those who are interested in this feature of early Irish literature may be referred to Prof. Rhys's Hibbert lectures, where the solar explanation of Celtic myths receives full consideration, and to Mr. Nutt's study of the "Celtic Doctrine of Rebirth" in "The Voyage of Bran." It is precisely because these Irish tales can provide materials for serious works of this kind that their perusal will be found, not only interesting, but profitable; and this new version of the Cuchulain cycle may do good service in spreading a knowledge of Celtic legend outside the small circle of scholars who have made it a subject of special study.

#### OUR BOOK SHELF.

*Flora Arctica.* Part i. By C. H. Ostenfeld. Pp. xi + 136. (Copenhagen: Det Nordiske Forlag, 1902.)

THE records of plants collected in the Arctic regions are for the most part scattered through numerous papers and written in various languages. At the request of Prof. Warming, Mr. O. Gelert in 1898 undertook to work up, revise and combine the accumulated data, basing his investigations on the collections belonging to the Copenhagen Museum. The work promised to be so extensive that he requested Mr. C. H. Ostenfeld to cooperate with him. This cooperation was cut short in 1899 by Mr. Gelert's premature death, and since that time Mr. Ostenfeld has continued the work alone. The limits of the Arctic territory as here interpreted coincide fairly nearly with the limits of the wood-boundary. This has its anomalies, for, as shown by the map provided, all Greenland is included almost to the 60th parallel, while Iceland in longitude 65° N. and Norway which extends higher than the 70th parallel are excluded. This the first volume contains the Pteridophyta, Gymnospermæ and Monocotyledons. The Pteridophytes are very few in number, the large group of Filices being limited to ten species. The Gymnosperms included are but three, this being the result of the boundary adopted. Amongst the Monocotyledons the most extensive orders are the Gramineæ, with twenty-four genera and sixty-one species, and the Cyperaceæ, including six genera, of which *Carex*, the most important, is subdivided into fifty-four species. In dealing with this genus the author has had the benefit of Mr. C. B. Clarke's valuable assistance. The Gramineæ were undertaken by Mr. Gelert, and the arrangement given is that left by him. The larger proportion of the illustrations refer to the Carices;